

REMARKS

The Final Office Action mailed June 18, 2007, has been carefully reviewed and these remarks are responsive thereto. Claims 1, 3-14, and 27-32 are currently pending in this application. Claim 1 has been cancelled and new claims 33-39 have been added. Thus, claims 3-14 and 27-39 are at issue. Reconsideration and allowance of the instant application are respectfully requested in view of the remarks presented in this response.

I. Claim Rejection Under 35 U.S.C. §102

A. Rejections Over Butcher

Claims 1, 27, 29, and 31 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,814,029 to Butcher ("Butcher"). Applicants submit that new independent claim 33 and dependent claims 27, 29, and 31 are patentable over Butcher. Applicants further submit that new claims 34-39 are also patentable over Butcher, for reasons summarized below.

1. Claims 27, 29, 31, 33, and 34

Claim 33 includes, among other elements, "depositing the filaments onto a working surface in a plurality of layers, in a predetermined orientation, using a computer-controlled deposition mechanism, to provide a green body." Butcher does not disclose at least this element of claim 33. More specifically, Butcher does not disclose the use of a computer-controlled deposition mechanism. Further, as described in previous Responses, the process described in Butcher merely involves packing and re-packing strands into an extrusion barrel to form a ceramic body having a desired number of cores. Applicants submit that there would be no benefit to using a computer-controlled deposition mechanism to pack the strands into an extrusion barrel. Accordingly, Butcher does not disclose this feature of claim 33, and cannot anticipate claim 33. For the same reasons, Butcher cannot anticipate dependent claims 27, 29, and 31, or new dependent claim 34, which contain all the elements of claim 33.

Additionally, new dependent claim 34 recites that "each layer of the green body has a geometry corresponding to a horizontal cross section of the heat exchanger." Butcher also does not disclose this element of claim 34. The Examiner asserts, at Page 13 of the Office Action, "The Examiner considers the repacking of a number of multi-core strands into an extrusion

barrel ... to meet the limitation of mechanically processing and depositing the filaments onto a working surface (extrusion barrel) in one or more layers (layers of multiple strands)." However, the body formed by repacking the strands into the extrusion barrel does not have a geometry that corresponds to the horizontal cross section of the final article produced, because the strands are later re-extruded through the barrel before sintering and further processing. This re-extrusion step drastically changes the geometry of the layers, such as by reducing the cross-sectional dimension by a large factor. Accordingly, Butcher also does not disclose this element of dependent claim 34, and cannot anticipate claim 34 for at least this additional reason.

2. Claims 35 and 36

Claim 35 includes, among other features, "extruding the feed rod through a deposition nozzle onto a working surface in a plurality of layers, in a predetermined orientation, by mechanically manipulating at least one of the deposition nozzle and the working surface, to provide a green body formed of a plurality of two-component filaments." Butcher does not disclose at least this element of claim 35. More specifically, Butcher does not disclose extruding the feed rod directly onto the alleged working surface (the extrusion barrel). Instead, Butcher discloses extruding a strand, cutting the strand into pieces, and then re-packing the smaller strands into the extrusion barrel. (Butcher, Col. 4, Lns. 47-60). Additionally, Butcher does not disclose mechanically manipulating a deposition nozzle or the working surface in depositing filaments in a predetermined orientation to form a green body. Rather, as described above, Butcher merely involves packing and re-packing strands into an extrusion barrel to form a ceramic body having a desired number of cores. Packing strands into an extrusion barrel does not require such mechanical manipulation. Accordingly, Butcher does not disclose, teach, or suggest at least this feature of claim 35, and cannot anticipate claim 35. For the same reasons, Butcher also cannot anticipate dependent claim 36, which contains all the elements of claim 35.

Additionally, claim 36 recites, "each layer of the green body has a geometry corresponding to a horizontal cross section of the heat exchanger." For the same reasons stated above with respect to claim 34, Butcher cannot anticipate claim 36 for at least this additional reason.

3. Claims 37-39

Claim 37 includes, among other features, “wherein each layer formed of the deposited filaments has a geometry corresponding to a horizontal cross section of the heat exchanger.” This feature is similar to the features discussed above with respect to claims 34 and 36. As described above, Butcher does not disclose that the body formed in the extrusion barrel (the alleged working surface) has a geometry that corresponds to the cross section of the final article formed after sintering, because the geometry is changed by re-extrusion before the sintering step. Accordingly, Butcher cannot anticipate claim 37 for at least this reason. For the same reason, Butcher cannot anticipate dependent claims 38-39, which contain all the elements of claim 37.

Claim 38 also recites, “the filaments are arranged by depositing the filaments onto the working surface using a computer-controlled deposition mechanism.” For the same reasons described above with respect to claim 33, Butcher does not disclose this feature of claim 38. Additionally, claim 39 recites, “the computer-controlled deposition mechanism deposits the filaments in the predetermined orientation based on a CAD drawing of the green body.” Butcher also does not disclose this element of claim 39. As described above, Butcher does not disclose the use of a computer-controlled deposition mechanism. Thus, Butcher also does not disclose the use of a CAD drawing to establish the predetermined orientation of the strands. Indeed, one skilled in the art would not use a CAD drawing to pack strands into an extrusion barrel, which is alleged to be the recited “arranging the filaments on a working surface.” Accordingly, for these additional reasons, Butcher does not disclose all the elements of claims 38 and 39.

B. Rejections Over Musso

Claims 1, 5-6 and 27-32 stand rejected under 35 U.S.C. §102 for being unpatentable over Musso et al., U.S. Publication No. 2003/0173720 (“Musso”). Applicants submit that new independent claim 33 and dependent claims 5-6 and 27-32 are patentable over Musso. Applicants further submit that new claims 34-39 are also patentable over Musso, for reasons summarized below.

1. Claims 5-6, 27-33, and 34

Claim 33 includes, among other elements, “simultaneously co-extruding a first composition and a second composition to form a plurality of two-component filaments.” As stated in previous responses, Musso does not disclose this element of claim 33. First, Musso does not disclose extruding a two-component filament. By the Examiner’s own admission, Musso discloses that the second component is added by filling the a mold after the first component has already been placed in the mold. (Page 14 of the Office Action). Thus, Musso discloses only a plurality of single-component filaments surrounded by a bulk matrix material, and no two-component filament ever exists in Musso. Second, Musso does not disclose simultaneous co-extrusion. Applicants strongly request the Examiner to withdraw the position that placing core members into a mold and infiltrating the mold with a second composition is equivalent to “simultaneously co-extruding.” Applicants note that even the Examiner’s argument (at Page 14 of the Office Action) recites two separate “extrusions,” and two separate extrusions, by definition, cannot be considered simultaneous. Thus, Musso does not disclose this feature of claim 33.

Claim 33 also includes, among other elements, “depositing the filaments onto a working surface in a plurality of layers, in a predetermined orientation, using a computer-controlled deposition mechanism, to provide a green body.” Musso does not disclose at least this element of claim 33. More specifically, Musso does not disclose using a computer-controlled deposition mechanism to deposit filaments onto a working surface in a predetermined orientation. Additionally, one skilled in the art would not use a computer-controlled deposition mechanism in connection with the process disclosed in Musso, because Musso is directed toward mold forming techniques, rather than extrusion, and the precision of computer-controlled deposition is not necessary in such a process. Accordingly, Musso also does not disclose this element of claim 33, and, Musso cannot anticipate claim 33. For the same reasons, Musso also cannot anticipate dependent claims 5-6, 27-32, and 34 depending from claim 33.

2. Claims 35 and 36

Claim 35 includes, among other features, “forming a feed rod from a first composition and a second composition, the feed rod including the first composition encased in the second

composition,” and “extruding the feed rod through a deposition nozzle onto a working surface.” Musso does not disclose this element of claim 35. As described above, Musso does not disclose the use of a two-component feed rod that is extruded onto a working surface. Rather, Musso discloses placing core members in a mold or die and then filling the mold with a second composition. Accordingly, Musso does not disclose this element of claim 35.

Claim 35 also includes, among other features, “extruding the feed rod through a deposition nozzle onto a working surface in a plurality of layers, in a predetermined orientation, by mechanically manipulating at least one of the deposition nozzle and the working surface, to provide a green body formed of a plurality of two-component filaments.” Musso also does not disclose this element of claim 35. As described above, Musso teaches forming articles by mold techniques. Musso does not disclose extrusion of a two-component feed rod directly onto the working surface by mechanically manipulating the nozzle or the surface. Even the core compositions (36, 38) in Musso are not extruded directly onto the working surface, since the core compositions are disclosed to be wires or fibers that are pre-formed. (Musso, Par. 86-88). Accordingly, Musso also does not disclose this feature of claim 35, and cannot anticipate claim 35. For the same reasons, Musso also cannot anticipate dependent claim 36 depending from claim 35.

3. Claims 37-39

Claim 37 includes, among other features, “simultaneously co-extruding a first composition and a second composition to form a plurality of two-component filaments, each filament including the first composition encased in the second composition.” As described above with respect to claim 33, Musso does not disclose simultaneous co-extrusion, and also does not disclose any two-component filaments being formed or arranged. Accordingly, for the reasons stated above, Musso does not disclose this element of claim 37, and cannot anticipate claim 37.

Claim 37 also includes, among other features, “each layer formed of the deposited filaments has a geometry corresponding to a horizontal cross section of the heat exchanger.” As described above, Musso uses mold techniques to form a matrix material around a plurality of cores, which are then removed. Even if the cores are considered to be “deposited” in the mold,

the geometry of the body is cannot be formed until the mold is infiltrated with the matrix material. Thus, the layers of “filaments” (cores) placed in the mold of Musso cannot themselves have a geometry corresponding to a horizontal cross section of the final article produced. In contrast, in the method recited in claim 37, a plurality of filaments are deposited in layers, and the filaments themselves form a geometry corresponding to the horizontal cross section of the final article. Accordingly, Musso also does not disclose this element of claim 37, and cannot anticipate claim 37. For the same reasons, Musso also cannot anticipate dependent claims 38 and 39 depending from claim 33.

Claim 38 also recites, “the filaments are arranged by depositing the filaments onto the working surface using a computer-controlled deposition mechanism.” As described above with respect to claim 33, Musso does not disclose the use of a computer-controlled deposition mechanism. Additionally, claim 39 recites, “the computer-controlled deposition mechanism deposits the filaments in the predetermined orientation based on a CAD drawing of the green body.” Musso also does not disclose the use of a CAD drawing as a base for a predetermined orientation of deposited filaments. Thus, for these additional reasons, Musso does not anticipate claims 38 and 39.

II. Claim Rejections Under 35 U.S.C. §103

A. Rejections over Musso and Butcher

Claims 1, 5-6, and 27-32 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Musso in view of Butcher. Applicants submit that new independent claim 33 and dependent claims 5-6 and 27-32 are patentable over the combination of Musso and Butcher. Applicants further submit that new claims 34-39 are also patentable over the combination of Musso and Butcher, for reasons summarized below.

1. Claims 5-6 and 27-34

As described above, neither Musso nor Butcher discloses, teaches, or suggests “depositing the filaments onto a working surface in a plurality of layers, in a predetermined orientation, using a computer-controlled deposition mechanism, to provide a green body,” as recited in claim 33. Accordingly, since neither Musso nor Butcher discloses this element of

claim 33, no prima facie case of obviousness can be established with respect to claim 33. For the same reasons, no prima facie case of obviousness can be established with respect to dependent claims 5-6, 27-32, and 34 depending from claim 33.

2. Claims 35 and 36

As described above, neither Musso nor Butcher discloses, teaches, or suggests “extruding the feed rod through a deposition nozzle onto a working surface in a plurality of layers, in a predetermined orientation, by mechanically manipulating at least one of the deposition nozzle and the working surface, to provide a green body formed of a plurality of two-component filaments,” as recited in claim 35. Accordingly, since neither Musso nor Butcher discloses this element of claim 35, no prima facie case of obviousness can be established with respect to claim 35. For the same reasons, no prima facie case of obviousness can be established with respect to dependent claim 36 depending from claim 35.

3. Claims 37-39

As described above, neither Musso nor Butcher discloses, teaches, or suggests “each layer formed of the deposited filaments has a geometry corresponding to a horizontal cross section of the heat exchanger,” as recited in claim 37. Accordingly, since neither Musso nor Butcher discloses this element of claim 37, no prima facie case of obviousness can be established with respect to claim 37. For the same reasons, no prima facie case of obviousness can be established with respect to dependent claims 38-39 depending from claim 35.

Claim 38 also recites, “the filaments are arranged by depositing the filaments onto the working surface using a computer-controlled deposition mechanism.” Additionally, claim 39 recites, “the computer-controlled deposition mechanism deposits the filaments in the predetermined orientation based on a CAD drawing of the green body.” As described above, neither Musso nor Butcher discloses, teaches, or suggests these features of claims 38 and 39. Thus, for these additional reasons, no prima facie case of obviousness can be established with respect to claims 38 and 39.

4. Combination of Musso and Butcher

Further, the teachings of Butcher and Musso cannot properly be combined as proposed by the Examiner to form an obviousness rejection. Butcher and Musso are not complementary technologies. Rather, they represent two completely different techniques for accomplishing the same goal – creating a multi-channeled body. While Butcher teaches extrusion and re-extrusion to form a body having a plurality of channels, Musso teaches using mold techniques to form a matrix around solid cores and mechanically pulling the cores out to leave channels in the matrix. In this sense, Musso and Butcher teach away from each other, because both purport to achieve the desired results using different techniques. Additionally, because these two techniques are so different, certain aspects of the techniques cannot be taken from one and applied to the other. For example, it is not clear how the Examiner proposes that the co-extrusion techniques of Butcher would be incorporated into the mold techniques of Musso, or what result one skilled in the art would hope to achieve by such combination. Applicants submit if a combination of Musso and Butcher is to be made, the Examiner must at least explain how and why the techniques would be combined and what specific method would result to render Applicants' claims obvious. Because this has not been done, no prima facie case of obviousness can be formed from the combination of Musso and Butcher.

B. Other Rejections

Claim 3 stands rejected under 35 U.S.C. §103(a) for being unpatentable over Musso et al., in view of Butcher and Hoopman et al., U.S. Patent No. 5,317,805 (“Hoopman et al.”). Claim 4 stands rejected under 35 U.S.C. §103(a) for being unpatentable over Musso et al., in view of Butcher and Hoopman as applied to claim 3 and further in view of Davenport, U.S. Patent No. 3,222,144 (“Davenport”). Claim 7 stands rejected under 35 U.S.C. §103(a) for being unpatentable over Musso et al., in view of Butcher and Hanaki et al., U.S. Patent No. 4,746,479 (“Hanaki et al.”). Claims 8-10 stand rejected under 35 U.S.C. §103(a) for being unpatentable over Musso et al., in view of Butcher and Avakian, Publication No. US 2004/0106713 (“Avakian”). Claims 8 and 9 alternatively stand rejected under 35 U.S.C. §103(a) for being unpatentable over Musso et al., in view of Butcher and Ocher et al., Publication No. US 2003/0131476 (“Ocher et al.”). Claims 11 and 12 stand rejected under 35 U.S.C. §103(a) for being unpatentable over Musso et al., in view of Butcher and Rainer et al., U.S. Patent No.

5,533,258 ("Rainer et al."). Claim 13 stands rejected under 35 U.S.C. §103(a) for being unpatentable over Musso et al., in view of Butcher and Rossi, Publication No. US 2002/0037142 ("Rossi"). Claim 14 stands rejected under 35 U.S.C. §103(a) for being unpatentable over Musso et al., in view of Butcher and McCullough, U.S. Patent No. 6,093,961 ("McCullough").

As discussed above, Musso and Butcher combined do not disclose, teach, or suggest all the elements of new independent claim 33, including at least the element, "depositing the filaments onto a working surface in a plurality of layers, in a predetermined orientation, using a computer-controlled deposition mechanism, to provide a green body." Rejected claims 3, 4, and 7-14 all now depend from new claim 33. None of Hoopman et al., Davenport, Hanaki et al., Avakian, Ocher et al., Rainer et al., Rossi, and McCullough disclose, teach, or suggest the method of manufacture as claimed and do not provide any teachings to cure the deficiencies of Musso and Butcher. Accordingly, the cited references, either alone or in combination, do not disclose, teach or suggest the invention of claims 3, 4, 7-14, and no prima facie case of obviousness has been established with respect to claims 3, 4, 7-14.

CONCLUSION

In view of the above amendments and remarks, prompt reconsideration and full allowance of the claims pending in the subject application are respectfully requested. All rejections have been addressed by the amended set of claims, and no new matter has been added. Applicants respectfully submit that the instant application is in condition for allowance and respectfully solicit prompt notification of the same.

The Commissioner is authorized to debit or credit Deposit Account No. 19-0733 for any fees due in connection with the filing of this response.

If the Examiner has any questions, the Examiner is invited to contact the undersigned at the number set forth below.

Date: October 31, 2007

Respectfully submitted,

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